CLAIMS

1. A method for vibration isolation wherein nearly infinite rigidity adequate for preventing direct disturbances is achieved and vibration from the base is isolated due to the functioning of the first member installed between the base and the second member; the supporter set comprises two individual supporters with positive and negative spring characteristics, respectively, connected in series; and the load supporter with positive spring characteristics is installed between the base and the second member in parallel with said supporter set,

2. A method for vibration isolation wherein vibration transmitted from the base to the first member is isolated by the springs installed between the base and the first member; vibration transmitted from the first to the second member is isolated by the magnetic levitation mechanism with zero-power characteristics comprising permanent magnets and electromagnets that are installed between the first and the second members and by the load supporter with positive spring characteristics that is installed between the base and the second member; and the load acting on the second member is supported by said magnetic levitation mechanism and said load supporter,

3. A method for vibration isolation wherein vibration transmitted from the base to the first member is isolated by the springs installed between the base and the first member; vibration transmitted from the first to the second member is isolated by the magnetic levitation mechanism with zero-power characteristics comprising permanent magnets and electromagnets and the spring elements with positive spring characteristics in parallel with said magnetic levitation mechanism that is installed between the first and the second

members, and the load supporter with positive spring characteristics is installed between the base and the second member; and the load acting on the second member is supported by said magnetic levitation mechanism and said load supporter,

4. A method for vibration isolation wherein vibration transmitted from the base to the first member is isolated by the spring elements with positive spring characteristics and the linear actuator in parallel with said spring elements that are installed between the base and the first member; vibration transmitted from the first to the second member is isolated by the magnetic levitation mechanism with zero-power characteristics comprising permanent magnets and electromagnets that is installed between the first and the second members, and the load supporter with positive spring characteristics is installed between the base and the second member; and the load acting on the second member is supported by said magnetic levitation mechanism and said load supporter,

5. A method for vibration isolation wherein vibration transmitted from the base to the first member is isolated by the springs installed between the base and the first member; vibration transmitted from the first to the second member is isolated by the zero-power magnetic levitation mechanism with negative spring characteristics that is installed between the first and the second members and the load supporter comprising pneumatic springs with positive spring characteristics installed between the second member and the base; and a part of the load acting on the second member is supported by said load supporter,

6. An apparatus for vibration isolation comprising the intermediate plate supported on the base by the springs with specified positive spring characteristics; the vibration-isolating table is supported on the intermediate

plate by the magnetic levitation mechanism with zero-power characteristics and the specified negative spring characteristics comprising permanent magnets and electromagnets; and the load supporter with positive spring characteristics is installed between the vibration-isolating table and the base,

7. An apparatus for vibration isolation comprising the intermediate plate supported on the base by the springs with specified positive spring characteristics; the vibration-isolating table is supported on the intermediate plate by the magnetic levitation mechanism with zero-power characteristics and the specified negative spring characteristics comprising permanent magnets and electromagnets and by the spring elements with positive spring characteristics arranged in parallel with the magnetic levitation mechanism; and the load supporter with positive spring characteristics is arranged between said vibration-isolating table and said base,

8. An apparatus for vibration isolation comprising the intermediate plate supported on the base by the spring elements with specified positive spring characteristics and the linear actuator; the vibration-isolating table is supported on the intermediate plate by the magnetic levitation mechanism with zero-power characteristics and the specified negative spring characteristics comprising permanent magnets and electromagnets; and the load supporter with positive spring characteristics is installed between said vibration-isolating table and said base,

9. The apparatus for vibration isolation as claimed in any of Claims 6 through 8 wherein said load supporter comprises the spring elements with positive spring characteristics and the damper of the specified damping rate is installed in parallel with said spring elements,

10. The apparatus for vibration isolation as claimed in any of Claims 6 through 8 wherein said load supporter comprises the pneumatic springs with positive spring characteristics,

11. The apparatus for vibration isolation as claimed in any of Claims 6 through 10 wherein the damper of the specified damping rate is installed between the base and the intermediate plate in combination with said spring elements with positive spring characteristics,

12. The apparatus for vibration isolation as claimed in any of Claims 6 through 11 wherein attraction of the electromagnets of said magnetic levitation mechanism is variable with changes in the load acting on the vibration-isolating table,

13. The apparatus for vibration isolation as claimed in any of Claims 6 through 12 wherein the halves of said base and vibration-isolating table are connected by their respective tie members; the halves of the base and the vibration-isolating table are arrayed alternately; and the intermediate plate is installed between one half of the base and one half of the vibration-isolating table,

14. The apparatus for vibration isolation as claimed in any of Claims 6 through 13 wherein said base is the floor of the apparatus for vibration isolation,

15. The apparatus for vibration isolation as claimed in any of Claims 6 through 13 wherein at least one each of the base, intermediate plate or vibration-isolating table are modularized into one functional unit,

16. A method for vibration isolation wherein vibration transmitted

from the base to the first member is isolated by the springs installed between the base and the first member; vibration transmitted from the first to the second member is isolated by the supporter with negative spring characteristics comprising the actuator and the controller that is installed between the first and the second members; and a part of the load acting on the second member is supported by the load supporter with positive spring characteristics that is installed between the second member and the base,

17. A method for vibration isolation wherein vibration transmitted from the base to the first member is isolated by the springs installed between the base and the first member; vibration transmitted from the first to the second member is isolated by the supporter with negative spring characteristics comprising the actuator and the controller that is installed between the first and the second members and by the spring elements with positive spring characteristics that are installed between the first and the second member; and a part of the load acting on the second member is supported by the load supporter with positive spring characteristics that is installed between the second member and the base,

18. A method for vibration isolation wherein vibration transmitted from the base to the first member is isolated by the supporter with positive spring characteristics and the linear actuator that is installed between the base and the first member; vibration transmitted from the first to the second member is isolated by the supporter with negative spring characteristics comprising the actuator and the controller that is installed between the first and the second members and by the spring elements with positive spring characteristics between the first and the second member in parallel with said actuator; and a part of the load acting on the second member is supported by the load supporter with positive spring characteristics that is installed between the second member and the base,

19. An apparatus for vibration isolation comprising the intermediate plate supported on the base by the spring elements with specified positive spring characteristics; the vibration-isolating table supported on the intermediate plate by the supporter with specified negative spring characteristics comprising the actuator and the controller; and the load supporter with positive spring characteristics that is installed between the vibration-isolating table and the base,

20. An apparatus for vibration isolation comprising the intermediate plate supported on the base by the spring elements with specified positive spring characteristics and the linear actuator; the vibration-isolating table supported on the intermediate plate by the supporter with specified negative spring characteristics comprising the actuator and the controller; and the load supporter with positive spring characteristics that is installed between the vibration-isolating table and the base,

21. The apparatus for vibration isolation as claimed in Claims 19 or 20 wherein the spring elements with positive spring characteristics are installed in parallel with the supporter (actuator) that is installed between the intermediate plate and the vibration-isolating table,

22. The apparatus for vibration isolation as claimed in any of Claims 19 through 21 wherein the halves of said base and vibration-isolating table are connected by their respective tie members; the halves of the base and the vibration-isolating table are arrayed alternately; and the intermediate plate is installed between one half of the base and one half of the vibration-isolating table,

23. The apparatus for vibration isolation as claimed in any of Claims 19 through 22 wherein said base is the floor of the apparatus for vibration isolation,

24. The apparatus for vibration isolation as claimed in any of Claims 19 through 22 wherein at least one each of the base, intermediate plate or vibration-isolating table are modularized into one functional unit,

25. An apparatus for vibration isolation comprising more than one intermediate plate supported on the base by the spring elements with specified positive spring characteristics; the vibration-isolating table is supported on said intermediate plates by the supporter with specified negative spring characteristics comprising the actuator and the controller; and the load supporter with positive spring characteristics is installed between the vibration-isolating table and the base,

26. The apparatus for vibration isolation as claimed in any of Claims 19 through 25 wherein said load supporter comprises the springs with positive spring characteristics and the damper of the specified damping rate is installed in parallel with the springs,

27. The apparatus for vibration isolation as claimed in any of Claims 19 through 25 wherein said load supporter comprises the pneumatic springs with positive spring characteristics,

28. The apparatus for vibration isolation as claimed in any of Claims 19 through 25 wherein the damper of the specified damping rate is installed between the base and the intermediate plate in combination with said springs with positive spring characteristics,

29. The apparatus for vibration isolation as claimed in any of Claims 25 through 28 wherein elongation of the actuator that is installed on the intermediate plate is variable with changes in the load acting on the vibration-isolating table, and

30. The apparatus for vibration isolation as claimed in any of Claims 19 through 29 wherein said actuator is a voice coil motor, linear motor, pneumatic actuator, hydraulic actuator or other linear actuator and said controller comprises a displacement sensor, control circuit and power amplifier.

Abstract

The present invention relates to a method for vibration isolation featuring a two-part supporter made up of two supporters with positive and negative spring characteristics that are connected in series, and another supporter with positive spring characteristics that is installed in parallel with the two-part supporter. Vibration from the floor to the first member is isolated by the springs installed between the floor 1 and the first member 2; vibration transmitted from the first to the second member is isolated by the magnetic levitation mechanism 4 with zero-power characteristics comprising permanent magnets and electromagnets that are installed between the first member 2 and the second member 3 and by the load supporter 5 with positive spring characteristics that is installed between the base and the second member; and the load acting on the second member is supported by said magnetic levitation mechanism and said load supporter.